Letter, forwarding a paper on the formation of the Museum of Economic Geology of India, from Captain TREMENHEERE, *Engineers, to* H. TORRENS, ESQ. *Secretary to the Asiatic Society.*

Calcutta, 27th January, 1841.

I have the honour to state for the information of the President and Members of the Asiatic Society, that the collection of specimens forming the basis of a Museum of Economic Geology, is placed in the room which the Society has been pleased to appropriate to that purpose.

I regret that my stay in Calcutta is so short that I shall be unable to complete the labelling of the specimens before my departure for Moulmein. The labels are, however, all prepared, and Mr. Piddington has kindly undertaken to place them near to each specimen, so as to render them distinctly legible. Corresponding printed numbers, which are also ready, are to be affixed to the specimens themselves, the numbers now attached being only of a temporary description.

To provide, as far as possible, for obtaining specimens of Indian mineral products, &c., and to explain the principles and objects of a Museum of this description, I have prepared a memorandum, in which I have endeavoured to describe the substances which it is considered desirable to collect, and the indications by which localities, which are likely to afford them may be traced in such a manner as to require little or no previous acquaintance with mineralogy or geology, to render contributions useful and illustrative.

A similar communication has been made to the Government of Bengal, with a view of increasing the collection of specimens suited to the objects proposed; and should your Society concur in the suggestions contained in the paper herewith enclosed, its communication to the corresponding members of your Society, may prove of service to the Museum of Economic Geology, now forming.

It is my intention, in compliance with a suggestion from Government to that effect, to maintain a correspondence, during my absence, with the Curator of your Museum, by which, and by personal communication, on any occasional visit which I may make to Calcutta, I shall be able to arrange for the disposal of specimens, which the Curator may receive, in furtherance of the views herein alluded to.

MEMORANDUM.

Numerous specimens of coal, and of ores of the useful metals, recently received by Government from the Court of Directors, have been placed, with the consent of the Asiatic Society, in one of the Society's rooms, at their house in Park Street, where they are arranged for public inspection. These specimens form part of a collection, to which it is intended that additions shall be made, until a complete series, exhibiting the mineral products of Great Britain shall be obtained; exemplifying at the same time, their modes of occurrence in rock formations, and the processes of converting the rough ores to the metallic state. With this view communications have been opened with the Director of the Geological Survey of England, for the supply and interchange of specimens suited to the objects proposed.

Simultaneously with these, it is proposed to collect, with the aid of Engineer Officers, Officers of the Revenue Survey, and by donations from individuals interested in the subject, specimens of similar products and processes of manufacture of this country, which will be arranged in a manner convenient for comparison with the foregoing, and for exhibiting at one view the mineral resources of India.

To these will be added specimens of soils, and other substances, showing the application of Geology to Agriculture; specimens of materials used for public buildings, and for roads; models of machinery adapted to mining and agriculture in India; and, lastly, records of mining operations which have been undertaken, or are still in progress.

Materials will thus be obtained, at no distant date, for a Museum designed to illustrate the application of geology to the useful purposes of life, to be entitled " The Museum of Economic Geology of India."

The Museum already possesses a series of specimens of British coal and ironstone from the South Wales and South Staffordshire districts, from the forest of Dean, and from Newcastle. In British tin and copper ores, chiefly from Cornwall, the collection may be considered complete.

The collection of specimens, exhibiting the various stages of metallurgical processes, comprises illustrative series of iron-smelting, and manufacture, as practised in South Wales; of the tin smelting of Cornwall; and of copper smelting, as practised at Swansea. To these, it is intended to add the Bristol mode of manufacturing brass and the new and old methods of reducing zinc from its ores. Other mineral substances employed in the arts and manufactures will also be included, such as those illustrative of porcelain, common earthenware, pottery, fire bricks, and other manufactures from clays and their compounds, and of metallic oxides and earths employed as pigments, showing the mode in which they may be usefully and permanently associated with each other; as well as a series showing the important manufacture of glass.

In the agricultural section, specimens of Indian soils and subsoils, or subjacent rocks, will be collected, with information of the mode of treatment and usual produce of the land, together with the conditions of exposure and meteorological influences to which it is subject. By analyzing such specimens, the connection of agricultural products with the chemical and physical properties of the soil, as well the mineral and vegetable substances most fitted for increasing the fertility of the land, will be ascertained; and the results being compared with others similarly obtained in this, or in other countries,* correct principles will be established, either for the introduction of new products of cultivation, or for the improvement of those already existing. The substratum of soils being generally an element in their relative fertility, an inspection of these alone would lead to suggestions of much value to the cultivator, and to a knowledge of the geological character of the upper surface of the country from which they may be taken.

Another section will comprise stones, slates, marbles, porphyries, ornamental granites, and other building materials, as mortars, cements, and other artificial compounds, applicable to architectural and engineering purposes.

A focus will thus be presented, to concentrate all information relating to the Economic Geology of India, and it is considered that a collection of natural products, such as it will contain, may serve to point out localities which would be worthy of attention; and by exciting the interest of the private speculator, tend to develop the mineral and agricultural resources of the country. An efficient means would also be afforded, of imparting instruction to native youths, whose services may be made available towards the gradual accomplishment of the objects proposed, with reference to the vast extent of territory which is open to investigation.

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* We have learnt, while this Memorandum is passing through the press, that a far wider interest is taken at home in the improvement of India in connection with its agriculture, then has ever heretofore been the case. Our acting Curator, Mr. Piddington, having requested Mr. Stikeman the Secretary to the East India and China Association to procure for him some sugar soils from the West Indies, for comparative analysis with those of India, the Mauritius, &c. Mr. Stikeman applied to Lord John Russell, who, upon the recommendation of Sir John Cam Hobhouse, has kindly obtained an assortment of soils from the West Indies, and their arrival here is daily expected.—Ed.

It will be perceived from the above, that this Museum is not intended for the reception of specimens of rocks or fossils to illustrate points of theoretical geology, but to exhibit those substances occurring occasionally in the solid crust of the earth and others, which are applicable to the useful purposes of life.

Mineral substances.

To those therefore, who may be requested, or who may be desirous to afford assistance in furtherance of the objects here set forth, it will be sufficient to state, that, any mineral or metallic substances, accompanied by specimens of the rocks in which they are found, with descriptions of locality and mode of occurrence, will be of service to a Museum of this description. The fissures and crevices of rocky strata, either along shores, or in vallies and ravines, should be examined, and indications will often be found in water courses and river beds, whereby metallic ores may be traced to the source from whence they have been abraded. Tin, gold, and platina are usually found in such situations; small rounded masses of the former, denominated stream tin, being scarcely distinguishable, save by their higher specific gravity, from common pebbles. The sands of rivers should be sometimes washed, as should also the alluvial detritus found in valleys or beneath the surface of level plains. Indications of copper are often afforded by a ferruginous and somewhat friable substance near the surface, specimens of which are desirable, as they serve often, with practised miners, to point the probable prospect of ore beneath. The vicinity of rocks, coloured green, blue, &c. may also be worthy of examination.

If with such specimens, the probable thickness of the stratum of rocks in which they occur, its dip, including the angle of inclination to the horizon, and direction of the beds by compass, be given, as well as the direction of any fissures that may be observed, it will enhance the value of the information afforded. A convenient size for specimens, is about three inches square, and about an inch in thickness, those of the accompanying rock, may be four or four and a half by three inches, and about the same thickness. They should be carefully numbered, both on the specimens themselves, and on the envelope in which they are wrapped; one copy of the list to which the numbers will refer, should be transmitted by dawk, and another placed in the box with the specimens.

Building materials.

Specimens of slates, with the dimensions, quantity, and rate at which they can be obtained; also of marbles, and building stones, cut into six inch cubes, will be desirable. The expense of quarrying and of transport to the nearest water conveyance should be detailed. One side of the cubes should be left to exhibit the exposed or weathered surface of the rock, the others roughly chiselled. The cubes of marble may be polished, except on their under surfaces.

Examination of springs.

The quality of water at the issue of springs, and the sediment deposited by them, should be particularly noticed, as they rise to the surface, generally, at some fault or dislocation of the strata, and will probably be imbued with matter derived from the metallic bodies with which they may have been in contact. Thus, water percolating through a bed of coal has often its surface coated with a thin film of oxide of iron, derived from the decomposition of iron pyrites, diffused through the coal. When traces of coal are discovered, it would be very desirable to transmit pieces of the strata of rock with which it is supposed the coal is associated, stating the extent of surface which the deposit is believed to cover, and the depth at which it is found; accompanied, if possible, by a vertical section, with figured dimensions of the accompanying beds.

Operations of mining and reduction of ores.

Descriptions of native mining operations, and complete series of specimens showing the processes followed in the reduction of ores, in their various stages of progress, to the metallic state, will be highly valued, when accompanied by explanations of the modes of procedure.

Specimens of soils should always be forwarded in connection with communications, and inquiries of agricultural interest.

Soils.

Soils being generally the upper decomposed portions of subjacent mineral substances, whether hard rocks of various kinds, or clays, marls, sands, &c., mingled either naturally or artificially with vegetable and animal matter, it becomes very desirable in collecting specimens of them, that they should be accompanied by others of the hard rocks, clays, marls, sands, &c., on which they rest;

so that by careful analysis of the whole, with due attention to climate and the other obvious conditions to which they may have been exposed, some general and useful results may be brought to light, respecting the soils best fitted for the growth of the various plants usually cultivated in this country.

In selecting soils for the Museum of Economic Geology, care should be taken to obtain fair average specimens of the localities whence it may be considered desirable to send them; and to insure the true subsoil, subjacent hard rock, clay, sands, &c.; specimens of the latter should be obtained as near as possible beneath the spot whence the soil may have been so selected, for it sometimes happens, that the soil of a field varies in places, from resting upon different kinds of sub-soils.

The soil above hard rocks is not unfrequently separated from them by broken angular fragments, the half-decomposed portions of such hard rocks; specimens therefore of sub-soils, or subjacent mineral substances should, in such cases, be taken from the solid hard rocks beneath, and not from these fragments, which have commonly suffered too much decomposition to exhibit the real chemical composition of the rocks themselves. These angular fragments must not be confounded with gravels, sometimes overspreading hard rocks, to the depth of several feet, and chiefly or wholly composed of rounded pebbles, mixed with earthy, sandy, or clayey matter, the whole being often derived from a distance; for such gravels then form the true sub-soil, and the soil above them would partake of the character of the earth, sand, or clay, mixed with the pebbles, with the addition of the decomposed parts of such of the latter, as may disintegrate by the effects of the weather upon them.

The quantity of soil taken as a specimen, should weigh about a pound; it should be well dried and tied up in a canvass bag, labelled to correspond with a memorandum, in which the general agricultural produce of the spot, whence the specimen was taken, should be noted; the kinds of manure known to have been used upon it mentioned; the amount of grain or other crops per beegah stated; the dimensions of the beegah, and the best kind of produce which has been hitherto obtained from it, specified. A loose label should also be inclosed within the bag to guard against accidents. As so much depends on climate and position, the general character of the seasons should be pointed out, and the aspect of the ground, as regards exposure to prevalent or hard winds, with any slope the ground may have, and its height above the sea should be stated, specifying if possible, the general temperature of the locality, and the degrees of greatest heat and cold annually experienced.

With respect to specimens of sub-soils, if of marl, sand, or clay, portions weighing about a pound, should be dried, tied up in a canvas bag, and labelled, to correspond with the respective soils above them. If the subjacent rocks be hard, a piece weighing also a pound, and fresh broken from the body of the rock, as nearly as possible beneath the spot whence any specimen of soil may have been selected, would suffice, and should be wrapped in strong brown paper, labelled to correspond with the soil above it. As specimens of many sub-soils may be rendered valuable for the purpose of illustrating those either well or ill suited to the growth of such trees as by their roots penetrate beneath the upper soil, commonly known as vegetable mould or humus, and which upper soil supports the great bulk of the plants commonly cultivated; it would be desirable to add a memorandum to any specimens which may serve to illustrate points of that kind. All specimens of soils should, if possible, be enveloped in wax cloth, and even packed in tin cases or cannisters, if any are at hand.

When a sufficient number of specimens in either of the departments here mentioned, has been collected, they should be packed in a box, and be sent by the cheapest, most efficient, and safe conveyance, directed—

On Service.
The Curator of the Museum of the Asiatic Society,
Calcutta.

For the Museum
of Economic Geology.

At the same time a communication should be addressed to the Curator of the Museum of the Asiatic Society, under cover to

The Secretary to the Government of Bengal,
Fort William,

stating the conveyance by which the specimens have been forwarded, with copies of the memoranda attached to them, referring to numbers on the specimens, in order, as much as possible, to prevent their loss.

Calcutta :
22nd January, 1841.

I have printed with unfeigned pleasure, the foregoing memorandum, to the value of which no recommendation can add. Every friend to India, whether connected with the Society or not, will, it is earnestly hoped, aid in accomplishing the great ends, to which, by the liberality of the Court of Directors and of the Government of India, it may now aim; viz. the full development of the agricultural and mineral resources of the country. Since this memoir was read to the Society, the following contributions to the Museum of Economic Geology, in addition to the collections sent out by the Court of Directors, under the care of Capt. Tremenheere, have been received.

Mr. Piddington, Acting Curator, As. Soc. Museum.	Specimens of cotton, coffee, sugar, tobacco, and tea soils, &c. from India, the Mauritius, United States, Singapore, &c. of which many are analysed. Specimens of Burdwan iron ores: analysed. Specimens of the earths used in the curious red glazing of the native sugar pans. Specimen of white clay from Rotasghur, which may be used like pipe clay for claying sugar.

I doubt not that we shall shortly be enabled to add many more to this list. To use the words of Mr. Piddington, "Our friends have only to recollect, that nothing pertaining to, or derived from the earth, if useful to man, can be unacceptable to our intended collection, and that even what may to them appear an every-day matter, and of no moment, may be fraught with important results in the hands of others."

I append to this valuable paper, further correspondence of interest to the Society, and to subscribers to the Journal on this important subject of Geological research, it having been put at my disposal by the Committee of Papers.

G. A. Bushby, *Esq. Secretary to the Government of India,*
Sir, *General Department.*

Being authorised by the Honorable Court of Directors to deliver to the Government of India certain specimens illustrative of the mineral productions of England, I have now the honour to report my arrival at Calcutta, on the ship "Lord Hungerford," with these specimens under my charge. They consist of

43 Specimens of coal from the South Wales and South Staffordshire Coal districts; presented by Mr. H. T. De la Beche, F.R.S. &c., Director of the Museum of Economic Geology, under Her Majesty's Government.

10 Specimens of coal, and others of ironstone and limestone from the principal working beds near Birmingham; presented by J. S. Dawes, Esq.

50 Specimens of copper and other metallic ores, chiefly from Cornwall; presented by Mr. H. T. De la Beche.

119 Specimens of the ores of iron, copper, and tin, from South Wales, Cornwall, and elsewhere, collected by myself, amongst which are many specimens of copper ores; presented by Seymour Tremenheere, Esq.

24 Specimens illustrative of the process of tin smelting, exhibiting each stage of progress, from the rough ore to the metallic state; presented by Thomas Bolitho, Esq. of Penzance.

Details concerning the above are entered in a book, which is forwarded herewith, on the plan followed at the Museum of Economic Geology, wherein it is intended to describe the mineralogical character and geological connection of each specimen, together with such information as may be useful in tracing indications of similar substances in India.

The form of this, as well as of books of other Departments, kept at the Museum, is given in enclosure No. 1.

In addition to the specimens which have been enumerated, others have been promised by gentlemen connected with mining and smelting establishments; and as arrangements were made at the India House for their immediate dispatch, they may be expected shortly to arrive. They include,

Specimens of the process of copper smelting, as practised at Swansea; by H. Vigors, Esq.

Specimens illustrative of the modes in which the Cornish copper, lodes, occur in rock formations.

Specimens of the coal beds, and of ironstone from the Penydarren works at Merthyr Tydfil, and of the process of manufacture of different kinds of iron; by G. Grenfell, Esq.

Specimens of the principal coal beds, and of the iron ore, worked in the Forest of Dean; by — Protheroe, Esq.

Specimens of the principal working beds of the Newcastle coal field; by Charles Bigge, Esq.

Together with others, if the Government should desire them, which Mr. De la Beche will, I have no doubt, with the consent of the Commissioners of Her Majesty's Woods and Forests, be able to forward from time to time from the Museum of Economic Geology; many duplicates and spare pieces being often available for the purpose.

Some of the leading features of the mineral wealth of England, and the methods by which it is turned to the best advantage, will be thus represented, and will afford the means of comparison with similar products and processes in this country.

The mineral resources of India although more abundant, and more generally diffused than those of any other portion of the globe of equal surface, have hitherto attracted little attention; and have been aided in a very slight degree by the means which are necessary to their proper development. The search for metallic ores has been unguided either by the principles of science, or by the practice of other mining countries and workings conducted without the skill and power required to prosecute them successfully, have been confined to within small distances from the surface. Hence the stores of useful metals which India is known to possess remain comparatively untouched, and present at this day, almost a maiden field for improvement.

Enclosure No. 2, represents in a tabular form, localities wherein ores of the useful metals have been worked, and others which have been observed and recorded. The following is an abstract of the paper alluded to, showing the number of places in each of the principal ranges of hills, which produce the undermentioned ores.

	Iron.	Copper.	Tin.	Lead.	Silver.	Gold.	Antimony.	Sulphur.
Himalaya range, ...	9	10	...	4	...	river beds.	...	4
Aravully, ... Chittore, ...	6	10	...	5	1	...	1	...
Vindhya, ...	17	...	...	1	...	...	...	...
Kasya, ...	3	...	...	...	...	...	...	...
Assam Territory, ...	1	...	...	...	...	river beds.	...	...
Tenasserim, ...	2	1	1	2	...	...	1	...
Malabar range, ... Coromandel, ...	31	6	...	2	...	river beds.	...	3
Total, ...	69	27	1	14	1	river beds.	2	7

The extensive distribution of iron ores of good quality, is the leading feature of Indian mineralogy. These are found in great abundance in every range of hills, in some of which they have been worked on a very limited scale, but with great success, for long periods of time. In several instances, beds of coal occur contiguous to them, as at Hoshungabad, Palamow, Sheregur in the Burdwan district, on the Adjai, seventy miles south of Boglepore, Serrareem, and Cherrapoonjee.

The iron districts, Marwar, Bundelkund, a portion of Malwa, Behar, and Sambhulpore,* are situated within the limits of the great sandstone formation with which the coal measures of India are associated. It extends in a broad band across the centre of Hindoostan, from the valley of Assam westward, to that of the Indus, and it is probable that coal will be found in various parts of this formation, and sufficiently near to these deposits of iron, to render them extensively available for economical purposes. In the districts of Saugur, Jabulpore, and in the valley of the Nerbudda, limestone also occurs, the connection of which is important, as upon the union of these three substances, the success of iron-works depends.

This extensive sandstone tract, presents also another source of interest. In it the diamond mines of Punnah in Bundelkund are situated, and the strata here are believed to be identical with those containing the diamond breccia of the Ellore district, and of Cadapah, on the Pennar. These last have been traced as far north as Nagpoor, and other intermediate points of connection with the Bundelkund formation may also be found.

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* Captain Ouseley discovered a rich field of excellent coal on the banks of the Hurdah (Hutsoo of the maps) in last November.

The Himalayas at Kumaon, the Aravully range at Shekawattee, and the hills of the Nellore district, are the only portions of country which have been worked for copper: very few other localities are yet known; but in such extensive ranges of primary mountains of similar character, it may be asserted that deposits of copper are not confined to these localities only.

The Aravully range is of moderate elevation, and appears to offer facilities for further examination. The Singhana copper mines are at the northern extremity of this range, where the disturbing forces have probably acted with less intensity than elsewhere, and there is reason to believe that the lines of fissure in other portions, especially near the junction of the stratified rocks with granite, may partake of the same cupriferous character. This range has been found to be productive of lead also.

There is no evidence of tin westward of the Bramahpootra, but it occurs in alluvial ground in many parts of the eastern peninsula, from Burmah to the extremity of Malacca, Sumatra, and Banca where the chief deposit exists; abundant sources therefore of this metal remain unexplored in the ranges of hills which diverge to the south-east from the great Himalayan chain, to form this peninsula, of which Sumatra and Banca seem but disconnected portions; and it will most likely appear that Assam, at the northern extremity of this stanniferous country, will also yield tin in its alluvial formations, derived from the Himalayas, by which it is bounded.

These ranges of hills, are likewise the repositories from whence the rivers of Assam, Burmah, Ava, &c. receive the gold dust with which their sands are charged.

(Signed) G. B. TREMENHEERE,
Capt., *Engineers.*

Extract from Letter No. 70, *from the Secretary to the Government of Bengal, General Department, to Captain* G. B. TREMENHEERE, *dated the* 13*th January*, 1841.

In reply to your letter and its enclosures of the 24th ultimo, I am directed to convey to you the acknowledgments of the Right Honorable the Governor of Bengal, for the information and suggestions therein contained, and for the specimens of the mineral prōductions of England brought out by you.

A copy of your communication will be forwarded to the Asiatic Society, in whose rooms you will be pleased, agreeably to the accommodation which has been tendered by that body, to place the collection.

I am desired to observe, that if during your absence you will maintain a correspondence with the Curator of the Society's Museum, you may turn to servicable account the experience which you have acquired in England, for the formation of a Museum of Economic Geology, and the Asiatic Society will without doubt, upon any occasional visit which you may make to Calcutta, give you every facility of inspection, and allow such weight to your suggestions, as consistently with their rules may tend to the furtherance of the object in view.

It is the intention of the Right Honorable the Governor of Bengal to avail himself of your services and acquirements, in consequence of your appointment to the department of public works in the Tenasserim provinces, and to the superintendence of the Government forests, for the further prosecution of the inquiries commenced by the late Dr. Helfer into the mineral and commercial resources of the Tenasserim province, with a view to the development of the natural productions of that country.

Your particular attention will be directed in all your excursions to the practical geology and mineralogy of the Tenasserim territory, and you will report on the means and prospects of working any of the mines that have been, or may be discovered, and furnish specimens of all productions, in every possible case in duplicate, for the Government, and the Honorable the Court of Directors.

Note by Captain Tremenheere.

The following are suggestions concerning the mode by which the collection of geological specimens arrived from England, may be made useful.

By assigning for their reception a room in some public building, where they should be arranged in cabinets under glass, in a manner convenient for public inspection.

With them, or in an adjoining apartment, might be placed models of such machinery as is suited to the purposes of agriculture or mining in India.

A focus would thus be presented for the concentration of specimens of rocks, minerals, metallurgical processes, soils &c., from every locality, whereby a knowledge of the mineral resources, as well as of the capabilities of any district, in an agricultural point of view, would be gradually obtained.

These specimens, with descriptions accompanying, might be prepared according to printed instructions of the Committee of the Royal Society, framed for the guidance of those employed in Magnetic Observatories, whereby accurate accounts, with specimens, may be transmitted by persons entirely unacquainted with the sciences of geology, mineralogy or agriculture.

The Engineer Officers, or those of the Revenue Survey, with whose departments the physical character of the country is nearly connected, seem to present the best means by which such information may be obtained.

The specimens on their receipt, might undergo comparison with those already arranged, and be subjected, if essential towards the elucidation of a proposed object, to chemical analysis, for which purpose the services of a chemical analyst would be necessary.

Localities would thus be indicated, which might appear to be deserving of more particular examination, and to which it would be desirable to send a person properly qualified for the purpose.

It is conceived, that information so obtained would not only be of service to the Government, but, as the fullest publicity is intended, might serve to encourage private enterprize.

If such a system were in operation, it would afford the best means of imparting instruction in these subjects, both by lecture and manipulation, to youths of the medical school, or others who might eventually be attached to Executive Engineers, or to Collectors of Revenue; serving thus as an efficient medium of communication between such functionaries and the natives on matters tending to develop the natural resources of the country.

The reception of mining records is another object which may be combined with the above one, of great importance at this period, since records of all operations hitherto conducted under European superintendence can now be easily obtained. The want of such records in England has been much felt, and has been the cause of much useless expenditure of capital in modern times.

A collection of standard books, treating on the subjects above referred to, should be by degrees provided for.

G. B. Tremenheere.
Captain, Engineers.

FORM No. 1.

Ores of the useful Metals, Coals, and Mineral Mining Specimens, generally.

No.	Mineralogical description.	Locality.	Chemical composition.	How obtained.	Where obtained.	Donor's name, if presented.	Remarks.

No. 2.

Metallurgical Processes, and Manufactured Articles.

No.	Kind of substance.	Where manufactured.	By whom manufactured.	Composition of the substance.	How and where obtained.	Donor's name, if presented.	Remarks.

No. 3.

Specimens of Soils, and of the Rocks beneath them.

No.	Name of rock.	Mineral composition of rock.	General character of soil.	Analysis of the soil.	Character of agricultural produce of the soil.	Where and how obtained.	Name of donor.	Remarks.

No. 4.

Polished Granites, Porphyries, Marbles, &c., worked into columns, &c.

No.	Kind of substance.	Locality.	Form into which the specimen is worked.	Where, and by whom worked into form.	How and where obtained.	Donor's name, if presented.	Remarks.

No. 5.

Stones employed for Architectural or Engineering purposes.

No.	Kind of rock.	Geological series to which it belongs.	Locality.	Owner's name and residence.	Mineral composition.	Chemical analysis.	Specific gravity.	Resistance to pressure.	Resistance to frost.	Where employed & condition of buildings constructed of it.	Price per cubic foot or ton.	Where and how obtained.	Donor's name, if presented.	Remarks.

No. 6.

Museum of Economic Geology, Department of Her Majesty's Woods, &c. Return for the Quarter ending——

No.	Additions to the Museum.	When received.	Whetherpresented or purchased; if presented, by whom?	No. in Catalogue of Museum.	Number and description of analysis made for the Museum.	Number and description of analysis made for the Public.	Number and description of lectures delivered at the Museum.	Number of entries to the lectures.	Remarks.

Ores of the useful Metals found in India.

No.	Description of Ore.	Locality.	Province.	Hill range.	Mineralogical description.	Remarks.	Authority.
	Iron.	Dhamakot	Kumaon,	Himalaya,	Hematite,	An extensive bed, yielding from 30 to 60 per cent. of good iron.	Captain Herbert.
	,,	Ramgar,	Kumaon,	Himalaya,	Micaceous,	Supposed to be connected with the above.	
	,,	Kutsari,	Kumaon,	Himalaya,	Compact,	Yields the best iron in the province, & is accompanied with limestone.	
	,,	Chowgark,	Kumaon,	Himalaya,	Yellow oxide,	Contains some Manganese, and would afford a good steel.	
	,,	Sil,	Bishchir,	Himalaya,	Magnetic,	The iron made here is much in demand for sword blades. This and the Kutsari Mine are deemed worthy of attention.	
	,,	Kalsi,	Kumaon,	Himalaya,	Specular,	An extensive bed.	
	,,	Phagone,	Surmore,	Himalaya,	....	A large vein of Iron Ore.	Dr. Royle.
	,,	Chipal,	Surmore,	Himalaya,	....		
	,,	Deyrah,	....	Himalaya,	....	In the descent to Deyrah in quantities sufficient to be profitably worked.	
	,,	....	Manvar,	Aravully,	....	Very abundant in the hills, which bound these provinces. Several foundries are established.	Sir John Malcolm.
	,,	....	Mewar,	Aravully,	....		
	,,	Baug,	Malwa,	Vindhya,	....	Supplies iron to Indore.	
	,,	Chandurgh,	Malwa,	Vindhya,	....	Ore of quality abounds, but from the imperfect mode of working the metal, is only valued for common purposes.	Captain Dangerfield.
	,,	Kantcote,	Malwa,	Vindhya,	....		
	,,	Cheettakairee,	Malwa,	Chittore,	....	An ore of good quality and abundant in this neighbourhood.	
	,,	Gwalior,	....	Chittore,	Hematite,	This iron is much esteemed.	
	,,	Gorakpore,	....	Valley of the Nurbudda,	....	Beragur, Dangui, Baila, Powri, Mygowa, Moguila, Birsinpoor, Deori, Rijoa, Bamna, & Personah are other localities in this valley. An argillaceous limestone is near.	Captain Franklin.
	,,	Sakri,	....		....		
	,,	Feerozepoor,	....	Aravully,	Hematite,	Iron is sold at these places, at 10 seers per Rupee.	
	,,	Narnoul,	....	Aravully,	Hematite,		

Ores of the useful Metals found in India—(Continued.)

No.	Description of Ore.	Locality.	Province.	Hill range.	Mineralogical description,	Remarks.	Authority.
	Iron.	Hoshungabad,	Bhopal,	Vindhya,		Coal is said tc accompany it on both banks of the Bhoorna.	Lieut. Finnis.
	,,	Heerapore,	Bundelkund,		Hematite,	This iron ranks next to that of Gwalior	Capt. Herbert.
	,,	Katola,	Bundelkund,			Dharmuni, Waldana, and Sorai or other localities contiguous.	
	,,	Punnah,	Bundelkund,				
	,,	Boglepore,	Bahar,	Vindhya,		70 miles south of this it occurs with coal on the Adjai. The hilly portion of this province is rich in iron.	
	,,		Palamow,			Occurs with coal. The ore is rich and abundant.	
	,,	Sircunda,	Rajmahl,	Rajmahl,		In great abundance.	Mr. Glass.
	,,	Mesadhe,				Affords a very superior iron, and is abundant.	
	,,	Sheargur,	Burdwan,			Occurs with coal. The whole district affords valuable ores, which yield 50 per cent. of metal.	Mr. Jones.
	,,	Beradroog,	Goondwana,	Sautpore,		Coal is found here also on the river Towa.	
	,,	Amdeah,	Sumbhulpore,				Mr. Rose.
	,,	Tuesmahl,	Saugor,			30 miles NE. of Saugor, with limestone.	Rev. R. Everest.
	,,	Pandria,	Silhet,	Kasya,			Dr. McClelland.
	,,	Serrareem,		Kasya,		Occurs with coal. 20 seers of iron are sold for a rupee.	Mr. Jones.
	,,	Cherrapoonjee		Kasya,		Occurs with coal,	Col. Watson.
	,,		Assam,			Celebrated for its iron mines and steel.	
	,,	Moulmein,			Red iron clay,	Anthracite coal also occurs here.	Capt. Foley.
	,,	Tenasserim,			Oxide of iron,	Limestone also is near.	Capt. Low.
	,,	Tavoy,			Magnetic,		
	,,		Orissa,				
	,,		Hyderabad,		Hematite,	The ores are poor, and the iron expensive.	Dr. Voysey.
	,,	Doodgwana,	Hyderabad,	Sichell,	Hydrate,	At Indore also.	Dr. Malcolmson.

Ores of the useful Metals found in India—(Continued.)

No.	Description of Ore.	Locality.	Province.	Hill range.	Mineralogical description.	Remarks.	Authority.
	Iron.	Rajamundry,	N. Circar,	....	....	In considerable quantity.	Dr. Heyne.
	,,	Ghettypore,	Mysore,	Malabar,	....	Steel is manufactured.	
	,,	Chittledroog,	Mysore,	....	Iron glance,		
	,,	Darmaparam,	Mysore,	....	Clay iron stone,		
	,,	Yevogully,	Mysore,	....	Micaceous,	Near Sautgur. This ore is rich and abundant in the mountains of the Carnatic from Vellore to the Ghauts.	
	,,	Bangalore,	....	....	....	At Maugry there are many forges and a manufacture of steel.	
	,,	Kudavigada,	Buddela,	....	Iron glance,		
	,,	Ramanakapetta,	Ellore,	....	....	Ore can be obtained in any quantity, and in six other villages.	
	,,	Severndroog,	Koncan,	....	....	Also at Hurryhur, and Ruttengherry.	
		....	Guzerat,	....	....	On the SW. coast there are extensive iron works.	
	,,	Spendamungolem,	Salem,	....	....	Extensive iron works established by Mr. Heath; steel also is made.	Mr. Heath.
	,,	Konasamundrum,	....	Nermul,	Iron clay,	Celebrated for its steel called "Wootz," which is carried to Persia. The iron used in manufacture is in proportion of three parts from Mertpallee, and two from Condapoor. 110 Rupees weight, sold for 8 annas.	
	,,	Deemdoortee,	....	....	Magnetic,	Has been used for ages in making Damascus steel. Two-fifths of Indore iron are used in the process. The iron is said to be superior to any English iron, and even to the best Swedish. The mines afford a boundless supply, and are easily wrought.	Dr. Malcolmson.
	,,	Bangnapully,	Nellore,	....	Specular & Magnetic,	Occurs in the sandstone or Diamond breccia, also at Punnundrow, but not worked.	Dr. Malcolmson.

Ores of the useful Metals found in India—(Continued.)

No.	Description of Ore.	Locality.	Province.	Hill range.	Mineralogical description.	Remarks.	Authority.
	Iron.	Doodye,	Cutch,	....	....		Capt. Grant.
	,,	Taggoor,	Koncan,	....	Magnetic,		
	,,	....	Coomlietor,	....	....		
	Copper.	Dhanpur,	Kumaon,	Himalaya,	....	This is the principal mine in the district. The ore yields 50 per cent. of copper. It occurs in limestone rock and is easily worked.	Capt. Herbert.
	,,	Dhobri,	Kumaon,	Himalaya,	....		
	,,	Gangoli,	Kumaon,	Himalaya,	Doublesulphuret,	These mines are next in importance to those of Dhanpur and Dhobri. They occur in beds of indurated talc, which is easily excavated. At Pokri the schist is so soft as to cause great obstruction to the miners. At Khari ore has been observed in small quantity. All these ores are free from arsenic.	
	,,	Sira,	Kumaon,	Himalaya,	Doublesulphuret,		
	,,	Pokri,	Kumaon,	Himalaya,	Doublesulphuret,		
	,,	Khari,	Kumaon,	Himalaya,	....		
	,,	Shor Gurong,	Kumaon,	Himalaya,	....		
	,,	Khalsee,	....	Himalaya,	....		
	,,	Katmandu,	Nepaul,	Himalaya,	....	Has considerable manufactories of copper, brass, and bell metal.	Dr. Royle. Mr. Hodgson.
	,,	....	Gurwal	Himalaya,	....		Lt. Webb.
	,,	Singhana,	Shekawattee,	Aravully,	Yellow & grey, sulphurets and carbonates,	These mines have been worked for centuries. They are farmed annually for 14,000 rupees.	Capt. Boileau.
	,,	Khetri,	Shekawattee,	Aravully,			
	,,	Buboe,	Shekawattee,	Aravully,			
	,,	Ajmere,	Rajasthan,	Aravully,	Red oxides and carbonates,	The lode runs north and south. It is said that all the Ajmere valley, from Kishengurh to Rajgurh is traversed by copper lodes.	Capt. Dixon.
	,,	Rajgurh,	Rajasthan,	Aravully,			
	,,	Rajauri,	Rajasthan,	Aravully,			
	,,	Jeypoor,	Rajasthan,	Aravully,	....	Mines to the north are said to have formerly yielded revenue.	Col. Todd.
	,,	Saloombra,	Mewar,	....	....	Copper is coined by the chief of Saloombra,	
	,,	Mandal,	Mewar,	....	....	And in the valley of Oodeypoor.	Mr. J. Hardie.

Ores of the useful Metals found in India—(Continued.)

No.	Description of Ore.	Locality.	Province.	Hill range.	Mineralogical description.	Remarks.	Authority.
	Copper.	Basawur,	Bhurtpore,	....	....	This working has been abandoned.	Capt. Boileau.
	,,	Nellore,	....	....	Carbonate of copper with red oxide of iron.	The Indian Copper Mining Company has been formed at Madras, to turn the mineral stores of this district to advantage. The ores are free from sulphur and arsenic, and become quite pure on smelting.	Dr. Heyne.
	,,	Ongole,	....	....			
	,,	Wamgapadu,	....	....			
	,,	Gongpettah,	....	....			
	,,	Yerrapully,	....	....			
	,,	Agricondolah,	....	....			
	,,	Moulmein,	....	....	Carbonate,	Observed in limestone rock in excavations made for silver. In Siam and Tonquin. Mines are worked also at Acheen.	
	Tin.	Mergui,	Tenasserim,	....	....	Said to abound in tin.	
	,,	Singapore,	Malacca,	....	Stream Tin.	These mines have been reported upon by Captain Low; at Perar the tin is found 7 feet from the surface. Near to Prince of Wales Island, yields a pure tin called 'Ealin.'	Capt. Low.
	,,	Perar,	Malacca,	....			
	,,	Legar,	Malacca,	....			
	,,	Junk Ceylon,	....	....	....	500 tons were at one time exported annually, but now much less.	
	,,	Sumatra,	....	....	....		
	,,	Bancah,	....	....	....		
	,,	Burmah,	....	....	....		
	,,	Martaban,	....	....	....		
	Lead.	Borela,	Jaunsar,	Himalaya,	Granular Galena,	This mine paid formerly 2,000 Rs. annual rent. Capt. Drummond with a Cornish miner has gone there.	Capt. Herbert.
	,,	Maiyar,	Jaunsar,	Himalaya,	....	Paid formerly 4,000 Rupees annually.	
	,,	Bhatnor,	Jaunsar,	Himalaya,	....	Numerous galleries exist here, as well as at Borela.	
	,,	....	Nepaul,	Himalaya,	....		Mr. J. Harding.
	,,	Jowar,	Oodeypore,	Aravully,	Argentiferous,		
	,,	Ajmere,	Rajasthan,	Aravully,	Galena,	Mines have been formerly worked with advantage.	Sir J. Malcolm.

Ores of the useful Metals found in India—(Continued.)

No.	Description of Ore.	Locality.	Province.	Hill range.	Mineralogical description.	Remarks.	Authority.
	Lead.	Jeypoor,	Rajasthan,	Aravully,	....	Mines to the north are said to have yielded much revenue.	Capt. Dangerfield.
	,,	Nuseerabad,	Rajasthan,	Aravully,	....	Has been worked by Capt. Dixon for some years.	Capt. Dixon.
	,,	Jhodepoor,	Manvar,	....	....	30 miles to the SE.	
	,,	Luchmeepore,	Boglepore,	Vindhya,	....	40 miles from Boglepore there is a rich vein of galena.	Mr. Jones.
	,,	Bangnapilly,	Nellore,	....	Argentiferous galena,	A mine here formerly furnished the district with lead.	Dr. Heyne.
	,,	Parsuni,	Nagpur,	....	....	Lead has been found in the neighbouring hills.	Capt. Jenkins.
	,,	Tenasserim,	....	....	....	There are mines also in Ava, Burmah, and Siam.	Capt. Low.
	,,	Moulmein,	....	....	....		Capt. Foley.
	Silver.	Jowar,	Oodeypore,	Aravully,	Argentiferous galena.		
	,,	Assam,	....	....	....		
	,,	Bhootan,	....	....	....		
	,,	Siam,	....	....	....		
	,,	Umeerapoor,	Burmah,	....	....		
	,,	Badooem,	Burmah,	....	....	The principal mines.	
	,,	Woobalcolla,	Burmah,	....	....		
	,,	Bencoolen,	Sumatra,	....	....	There are rich mines at Songhipago, Songhiabo, and Sohungong.	
	,,	Padang,	....	....	....		
	Gold.	....	Nepaul,	....	....	In the beds of rivers issuing from the Himalayas.	Capt. Herbert.
	,,	....	Punjaub,	....	....		
	,,	The Gomti river,	....	....	....		
	,,	The Mahanuddy River.	....	....	....	The rivers of Berar, Golcondah, and the Deccan carry down gold dust in considerable quantities.	

Ores of the useful Metals found in India—(Continued.)

No.	Description of Ore.	Locality.	Province.	Hill range	Mineralogical description.	Remarks.	Authority.
	Gold.	Belamongslum,	Mysore, ...	....	....		
	,,	Assam, ...	....	....	....	Contains rich mines of gold.	Capt. Warren.
	,,	Badooem, ...	Ava, ...	....	....	Gold mines worked.	
	,,	Woobooltae, ...	Burmah, ...	....	....	Also at Umeerapoorah, Manipur; Noobooltoe is the richest.	
	,,	Bantuphannua,	Siam, ...	....	....	The mines yield 15,000 Rupees a year. They are in the latitude of Mergui.	
	,,	Batang Morung,	Malacca, ...	....	....	Occurs in granite; Cambodia, Laos, Cochin-China, Pegue, and Tonquin have gold also.	Lieut. Newbold.
	,,	Comtah, ...	Nagpur, ...	....	....		Capt. Jenkins.
	,,	Kah River, ...	Moradabad, ..	....	....		Mr. Ravenshaw.
	Antimony.	....	Malwa, ...	....	....	West of the frontier.	
	,,	Moulmein, ...	....	....	Sulphuret.		
	,,	Tavoy, ...	Malacca, ...	....	....	Also in Burmah and Siam.	
	Platina ..	Kamoe, ...	Ava, ...	....	....	In river beds with the gold washings.	Major Burney.
	Quicksilver,	Andaman Islands,	....	....	....		
	Manganese,	....	Ava, ...	....	....		
	Plumbago,	....	....	Himalaya, ...	....	Has been observed near the Soonth river in considerable quantities.	
	Sulphate of Iron,	....	Behar, ...	....	....	Occurs in efflorescence in rocks containing iron pyrites.	Mr. J. Stephenson.
	Sulphur, ..	....	Kumaon, ...	Himalaya, ...	....	Deposits in the galleries of lead mines and in river beds, as the Tonse, Ramgunge, and Jaunsar.	
	,,	Amalapor, ...	....	....	....	In a lake in the territory of the Peddsore Rajah.	
	,,	Colair Lake, ...	Ellore, ...	....	....	And at Cuddapah in the Nellore district.	
	,,	Sahansadhara. ..	....	Himalaya, ...	....	Below Mussooree there is a sulphurous spring.	Dr. Royle.
	Diamonds.	Malavully, ...	Ellore, ...	....	....	This is one of seven villages in the district near which diamond mines exist in the valley of the Kistnah.	Dr. Heyne.
	,,	Kondapully, ...	Ellore, ...	....	....		

Ores of the useful Metals found in India—(Concluded.)

No.	Description of Ore.	Locality.	Province.	Hill range.	Mineralogical description.	Remarks.	Authority.
	Diamonds.	Cuddapah, ...	....	....	....	In the valley of the Pennar. There are several mines in the valleys between these places and the low grounds to the North.	Dr. Heyne.
	,,	Gooty, ...	....	....	....		
	,,	Golconda, ...	....	....	....		
	,,	Budrachallam, ..	....	....	....	On the Godavery.	
	,,	Sumbhulpore, ..	....	....	....	On the Mahanuddy.	
	,,	Kurnool, ...	....	....	....		
	,,	Punnah, ...	Bundelkund, ..	....	....	The mines here yield 1,20,000 rupees annually to the Rajas of Punnah, Banda, Chercarie and Joitpore.	
	Alum.	Sahibgong, ...	Boglepore, ...	Vindhya, ...	Sulphate of Alumina.	Occurs in efflorescence in alum slate.	Mr. Campbell.
	,,	....	Nepaul, ...	....		Found in the Lower, Central, and Upper hills, within a few days' journey of the Ganges.	
	Cornelian.	Rae Peepla, ...	Baroach, ...	Suatpore, ...	....	The annual value formerly exported from Bombay was 11,000 lbs the produce of the mines.	
	Corundum.	Salem, ...	Carnatic, ...	....	....		
	,,	Kyalphyen, ...	Ava, ...	....	....		
	,,	Nellore, ...	....	....	....	In the Pennar district, and in the mountains of the Carnatic.	
	Ruby.	Songayuem, ...	Coimbatoor, ..	....	....	Other valuable gems, as the Spinel ruby, Zircon, Cat's eye, and Topaz, occur in the rivers of the sienitic and basaltic districts of the Peninsula, and in Ceylon.	
	,,	Kyalphyen, ...	Ava, ...	....	....		
	Sapphire.	Kyalphyen, ...	Ava, ...	....	....		
	Garnet.	Palunshah, ...	Hyderabad, ..	....	....	A mine of garnets.	Dr. Voysey.
						Porcelain earth is found at Ootacamund in the Neilgherries; and slates in any quantity at Bagulkata in the western Ghauts.	Dr. Benza. Lieut. Jervis.